Indiana State Department of Health
Injury Prevention Program
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Data Report on Traumatic Brain Injury

DATA HIGHLIGHTS

- The leading causes of TBI in the United States and in Indiana are falls, motor vehicle crashes, struck by/against events, and assaults. The estimated direct and indirect costs of TBI in the United States in 2000 were $60 billion.(1)

- In the United States, 1.4 million people sustain a TBI each year. Of the 1.4 million people, 50,000 die, 235,000 are hospitalized, and 1.1 million are treated and released from an emergency department (ED) each year.(2)

- The CDC has estimated that at least 5.3 million Americans, approximately 2% of the U.S. population, currently have long-term or lifelong need for help to perform activities of daily living as a result of a TBI.(3)

Indiana Data for 2003-2005:

Mortality Data

- There were 3,500 TBI deaths in Indiana. More males (2,557) died than females (943), with males dying at a rate almost three times greater than females. Although the number of deaths among whites (3,107) was higher than in blacks (368), the age-adjusted death rate shows that blacks died more often than whites in relation to their population.

- Males and females over 65 years of age had the highest TBI death rates. While whites over 65 years of age had the highest death rate, in blacks the highest death rate was in those ages 25-34 years.

- White males over 65 years of age (64.8 per 100,000) and black males 25-34 years of age (64.5 per 100,000) had almost identical TBI death rates.

Indiana Emergency Department Data

- Of the 1,662,783 outpatient/emergency department (ED) visits with a primary diagnosis for injury or poisoning, 63,936 were visits related to TBI, which represented 4% of all outpatient/ED visits. Of those receiving treatment at the outpatient/ED, 57% (36,663)

were male, and 43% (27,270) were female. The age-adjusted rates for visits to the outpatient/ED were similar for whites and blacks.

- The age group with the highest age-adjusted rate of outpatient/ED visits due to TBIs was 0 to 4 year olds with a rate of 1,671.12 per 100,000, followed by individuals 15 to 19 years of age with 680.74 per 100,000.

- The total charges for TBI that were treated in an outpatient/ED were $119 million. The majority of the patients had commercial insurance (34%) or Medicare/Medicaid (28%).

Indiana Hospital Inpatient Data

- There were 161,198 inpatient hospitalizations with a primary diagnosis of injury or poisoning. Of these, 13,762 were for TBI, which represents 9% of all hospital admissions patients who had a primary diagnosis of injury or poisoning.

- Of those admitted to the hospital for TBI, 62.5% were male and 37.5% were female. When comparing rates, males were 1.8 times more likely to be admitted to the hospital following a TBI than females. The age-adjusted rate for hospital admissions was higher in blacks compared to whites.

- The age group with the highest age-specific rate of hospital admissions due to TBIs was the 85+ year olds. The lowest age-specific rate of hospital admissions due to TBIs was the 1-4 year old population. The age-specific rates began increasing with the 65+ year olds.

- For 2003-2005, the total charges due to TBI patients who were admitted to the hospital were $422 million. The majority of the patients had Medicare/Medicaid (36%) or commercial insurance (30%). The average length of stay for a TBI patient was 6.79 days (Range 1- 152 days) and the median length of stay was four days.

Traumatic Brain Injury

2003-2005

Introduction

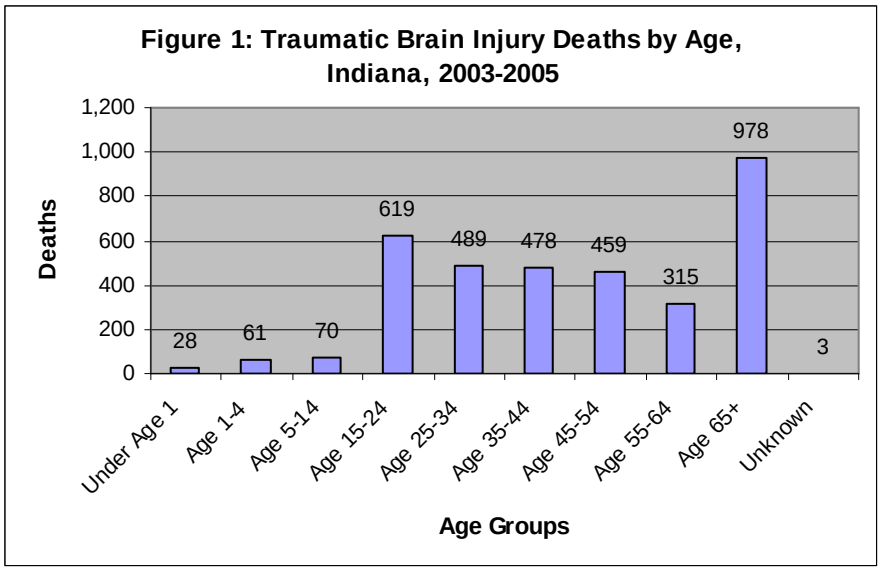
A traumatic brain injury (TBI) is defined as a blow or jolt to the head or a penetrating head injury that disrupts the function of the brain. Not all blows or jolts to the head result in TBI. The severity of TBI may range from "mild" to "severe" and can result in short or long-term problems with independent functioning. The leading causes of TBI are falls, motor vehicle crashes, struck by/against events, and assaults. The estimated direct and indirect costs of TBI in the United States in 2000 were $60 billion.[1]

According to data from the Centers of Disease Control (CDC), 1.4 million people sustain a TBI each year in the United States. Of the 1.4 million people, 50,000 die, 235,000 are hospitalized, and 1.1 million are treated and released from an emergency department (ED) each year. In the United States, males are about 1.5 times as likely as females to sustain a TBI. Blacks have the highest rate of death from TBI compared to all other races. The age groups at highest risk for TBI are 0-4 year olds and 15 to 19 year olds.[2] The CDC has estimated that at least 5.3 million Americans, approximately 2% of the U.S. population, currently have long-term or lifelong need for help to perform activities of daily living as a result of a TBI.[3]

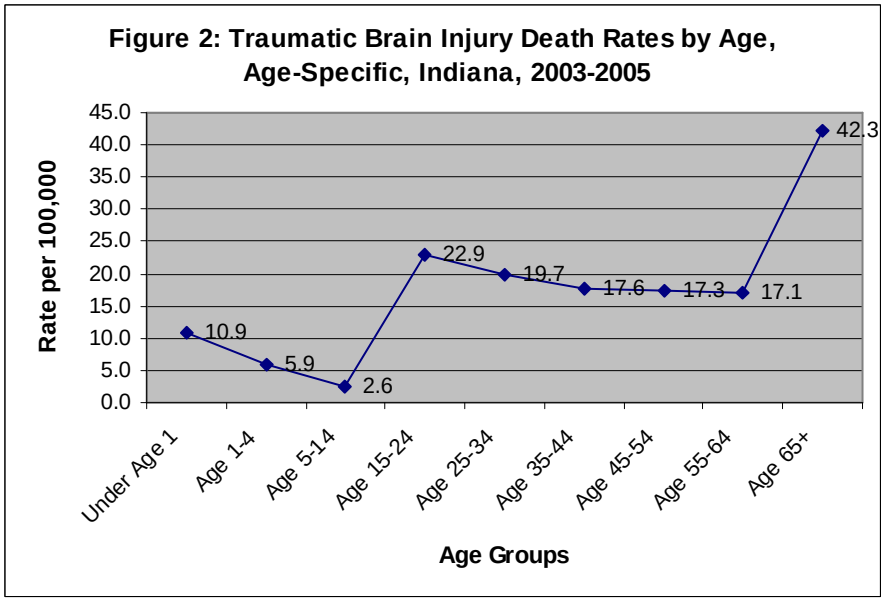
Mortality

Between 2003 and 2005, there were 3,500 TBI deaths in Indiana. More males (2,557) died than females (943), with males dying at a rate almost three times greater than females (27.8 per 100,000 for males, 9.9 per 100,000 for females). Although the number of deaths among whites (3,107) was higher than in blacks (368), the age-adjusted death rate shows that blacks (22.5 per 100,000) died more often than whites (18.7 per 100,000) in relation to their proportion in the population. Figure 1 shows the number of deaths per age category. When comparing death rates, Indiana residents over 65 years of age died most often from TBI injuries (42.3 per 100,000) followed by those ages 15-24 years (22.9 per 100,000) (Figure 2). When combining age and sex, males and females over 65 years of age had the highest rates (62.9 per 100,000 for males, 28.0 per 100,000 for females) (Table 1).[4]

When looking at race and age, whites over 65 years of age (43.6 per 100,000) had the highest rate; however for blacks the highest rate was in those ages 25-34 years (36.5 per 100,000) (Table 2). Blacks ages 15-24 years followed closely with a death rate of 34.8 per 100,000. When considering all race, sex, and age categories, white males over 65 years of age (64.8 per 100,000) and black males 25-34 years of age (64.5 per 100,000) had the highest rates with the death rates being almost identical (Table 3a). For females, whites over 65 years of age had the highest rate (28.8 per 100,000) followed by whites ages 15-24 years (11.7 per 100,000) (Table 3b). Rates for black females by age were unstable due to the low numbers of deaths in each category.[4]



Source: Indiana State Department of Health, Mortality Data, 2003-2005



Source: Indiana State Department of Health, Mortality Data, 2003-2005

Table 1: Traumatic Brain Injury Deaths and Rates by Sex and Age, Indiana, 2003-2005

	Male	Male	Female	Female
	Number	Age-adjusted Rate	Number	Age-adjusted Rate
Under Age 1	15	U	13	U
Age 1-4	36	6.8	26	5.1
Age 5-14	48	3.5	22	1.7
Age 15-24	474	34.3	145	11.0
Age 25-34	393	31.2	96	7.9
Age 35-44	376	27.6	102	7.5
Age 45-54	373	28.3	86	6.4
Age 55-64	244	27.4	71	7.5
Age 65+	596	62.9	382	28.0
Unknown	3	--	0	--
Total	2,558	27.8	943	9.9

U=numerator is less than 20 and the rate is unstable.
Source: Indiana State Department of Health, Mortality Data, 2003-2005

Table 2: Traumatic Brain Injury Deaths and Rates by Race and Age, Indiana, 2003-2005

	White	White	Black	Black	Other	Other
	Number	Age-adjusted Rate	Number	Age-adjusted Rate	Number	Age-adjusted Rate
Under Age 1	26	11.9	2	U	0	U
Age 1-4	54	6.1	6	U	1	U
Age 5-14	60	2.6	9	U	1	U
Age 15-24	522	22.2	94	34.8	3	U
Age 25-34	397	18.4	87	36.5	5	U
Age 35-44	417	17.2	54	23.5	7	U
Age 45-54	406	16.9	51	25.0	2	U
Age 55-64	285	16.8	28	23.8	2	U
Age 65+	939	43.6	37	27.4	2	U
Unknown	1	--	0	--	2	--
Total	3,107	18.7	368	22.5	25	5.2

U=numerator is less than 20 and the rate is unstable.
Source: Indiana State Department of Health, Mortality Data, 2003-2005

Table 3a: Traumatic Brain Injury Deaths and Rates by Race and Age, Males, Indiana, 2003-2005

	Males			
	White	**White**	**Black**	**Black**
	Number	Age-adjusted Rate	Number	Age-adjusted Rate
Under Age 1	13	U	2	U
Age 1-4	32	7.1	2	U
Age 5-14	39	3.3	8	U
Age 15-24	387	32.2	85	62.5
Age 25-34	317	28.7	74	64.5
Age 35-44	328	26.9	42	38.5
Age 45-54	331	27.6	40	42.5
Age 55-64	219	26.6	23	43.0
Age 65+	573	64.8	21	39.5
Unknown	1	--	0	--
Total	2,240	27.4	297	37.9

U=numerator is less than 20 and the rate is unstable.
Source: Indiana State Department of Health, Mortality Data, 2003-2005

Table 3b: Traumatic Brain Injury Deaths and Rates by Race and Age, Females, Indiana, 2003-2005

	Females			
	White	**White**	**Black**	**Black**
	Number	Age-adjusted Rate	Number	Age-adjusted Rate
Under Age 1	13	U	0	U
Age 1-4	22	5.1	4	U
Age 5-14	21	1.9	1	U
Age 15-24	135	11.7	9	U
Age 25-34	80	7.6	13	U
Age 35-44	89	7.4	12	U
Age 45-54	75	6.2	11	U
Age 55-64	66	7.6	5	U
Age 65+	366	28.8	19	U
Unknown	0	--	0	--
Total	867	10.3	74	8.7

U=numerator is less than 20 and the rate is unstable.
Source: Indiana State Department of Health, Mortality Data, 2003-2005

Morbidity

Hospital discharge data was queried using SAS, version 9.0 for TBI-related codes in any diagnosis field. Due to some patients having multiple TBI diagnosis, the data summarizes the first TBI code presented for each patient. TBI codes include: 800(.0-.9), 801 (.0-.9), 803(.0-.9), 804(.0-.9), 850(.0-.9), 851(.0-.9), 852(.0-.5), 853(.0-.1), 854(.0-.1), 950(.0-.3), 959.01, and 995.55.

Hospital discharge data give an indication of the number of TBI injuries in Indiana although the data have limitations. The hospital data base does not contain a patient-specific unique identifier, meaning that it does not distinguish whether one person had five visits or whether five people visited once. Therefore, statistics only reflect visits and not specific numbers of people. Also race/ethnicity data is not very accurate because race/ethnicity is at the discretion of the person reporting the data and may not reflect how the individuals would define themselves.

A major limitation of the hospital discharge data is that Indiana law does not mandate e-coding of hospital records. Only 55% of hospital records are e-coded. Also, Indiana law only requires hospital discharge data submission by acute care hospitals. Therefore, a few psychiatric and behavioral health hospitals do not submit data. All acute care hospitals are submitting inpatient data. However, one of the three Level 1 Trauma center hospitals has not submitted outpatient/emergency department data yet. As a result, **the total number of TBI incidents for the outpatient/emergency department data is an underestimation of the actual number of traumatic brain injuries and should be used with caution.**

Emergency Department Data

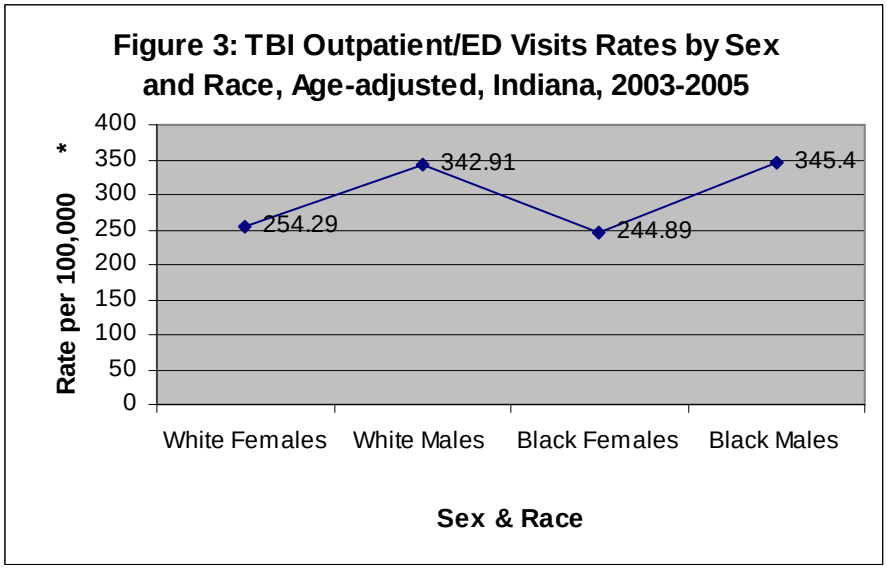
During 2003-2005, there were 1,662,783 outpatient/emergency department (ED) visits with a primary diagnosis for injury or poisoning (ICD-9-CM) codes 800-999. Of the 1,662,783 outpatient/ED visits, 63,936 were visits related to TBI and represented 4% of all outpatient/ED visits.[5]

Of those receiving treatment at the outpatient/ED, 57% (36,663) were male, and 43% (27,270) were female (three people's gender was unknown). When comparing rates, males had a higher rate of outpatient/ED visits than females (393.51 per 100,000 compared to 287.50 per 100,000). The majority (49,351/63,936) of the admissions to the outpatient/ED were white Indiana residents. Blacks made up 7.9% (5,074/63,936) and those in the minority/other category were 14.9% (9,511/63,936) of visits. The age-adjusted rates for visits to the outpatient/ED were similar for whites and blacks (300.50 per 100,000 versus 295.41 per 100,000). White males accounted for 43.9% (28,036/63,936) of all visits to the outpatient/ED, white females for 33.3% (21,313/63,936), black males for 4.6% (2,947/63,936), and 3.3% for black females. However, when comparing rates black males had the second highest age-adjusted rate (345.40 per 100,000) despite the lower number of injuries (Figure 3).[5]

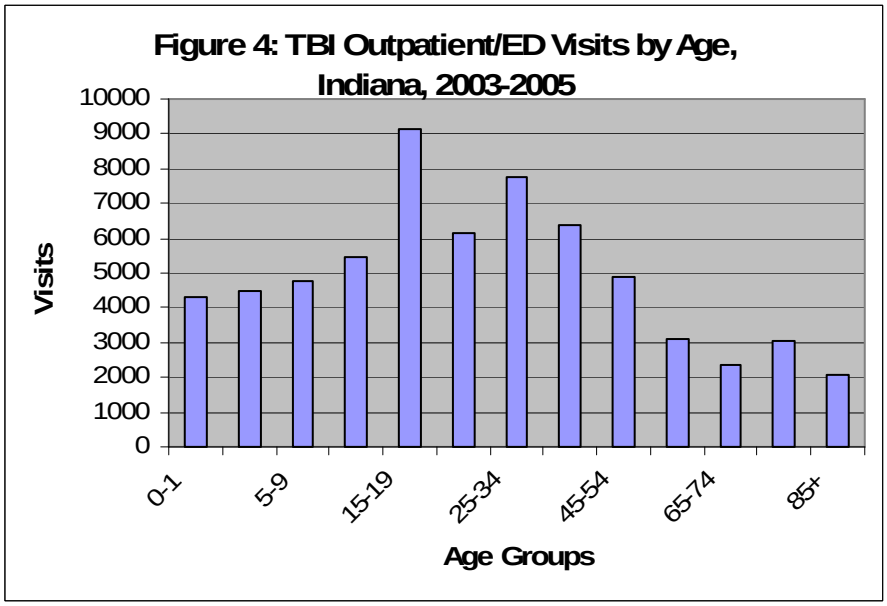
During 2003-2005, the age group with the highest age-adjusted rate of visits to the outpatient/ED due to TBIs was the 0 to 4 year olds with a rate of 1,671.12 per 100,000 followed by individuals 15 to 19 years of age with 680.74 per 100,000. The lowest age-adjusted rate of visits to the outpatient/ED due to TBIs was for those 55 to 64 years of age. Figure 4 shows the actual number of hospital outpatient/ED for each age group while Figure 5 shows the age-adjusted rate for each age group.[5]

The median total charge for patients seen in the outpatient/ED for TBI injury was $1,410.00 (Range $0-$70,658) as compared to the mean total charge for all ages of $1,875.00 (Range $0 - $70,658) (4). For 2003-2005, the total charges for TBI that were treated in an outpatient/ED

were $119 million. The majority of the patients had commercial insurance (34%, 21,819/63,936) or Medicare/Medicaid (28%, 17,992/63,936) (Figure 6).[5]



Source: Indiana State Department of Health, Hospital Discharge Data, 2003-2005



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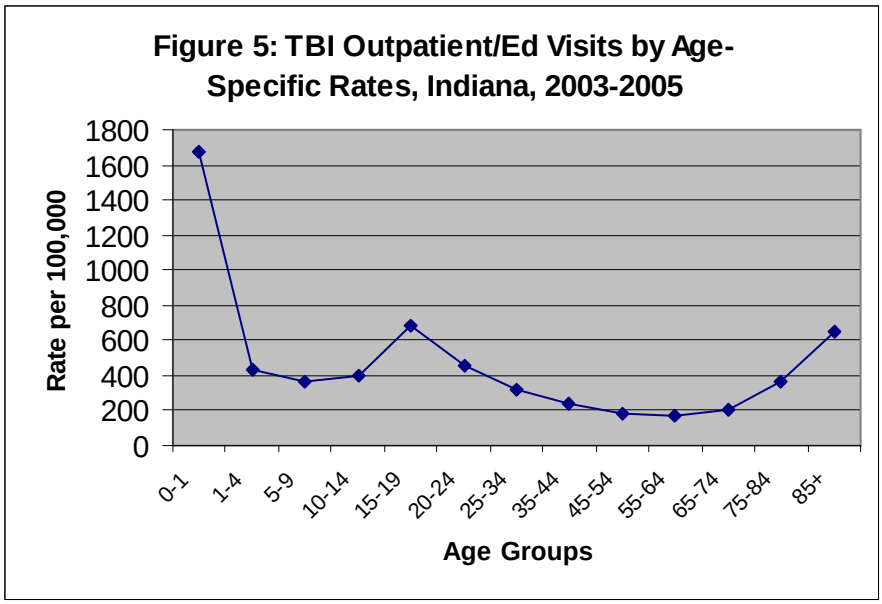

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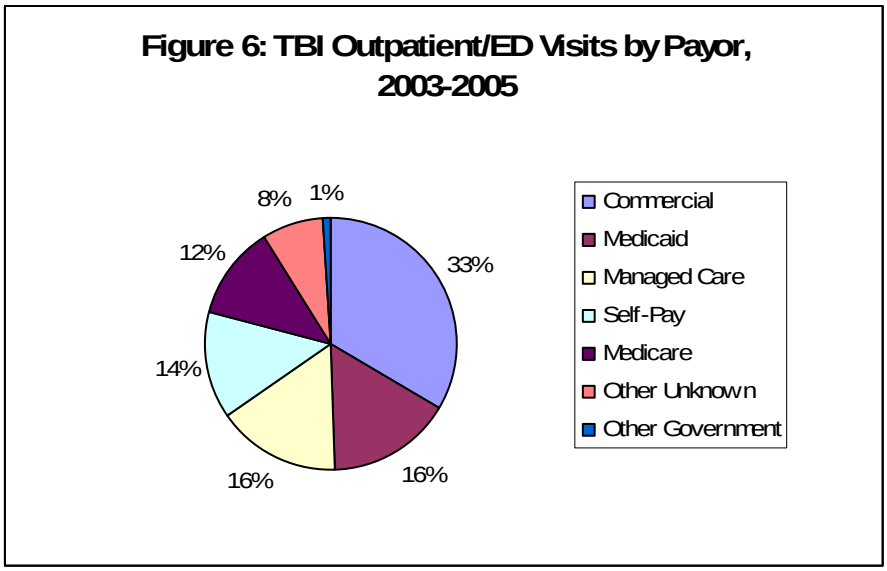


Source: Indiana State Department of Health, Hospital Discharge Data, 2003-2005

Inpatient Hospital Data

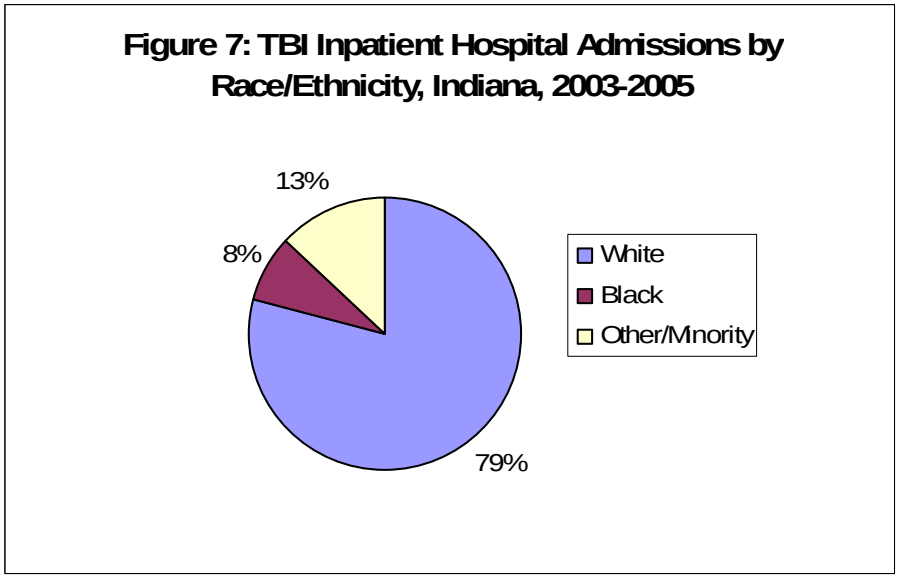
From 2003-2005, there were 161,198 inpatient hospitalizations with a primary diagnosis of injury or poisoning. Of these, 13,762 were TBI which represent 9% of all hospital admissions for patients who had a primary diagnosis of injury or poisoning.[(5)]

Of those admitted to the hospital 62.5% (8,599/13,762) were male and 37.5% (5,162/13,762) were female (one person's gender was unknown). When comparing rates, males were 1.8 times

more likely to be admitted to the hospital following a TBI than females. The majority (79%, (10,882/13,762) of the hospital admissions were white Indiana residents (Figure 7). However, the age-adjusted rate for hospital admissions was higher in blacks compared to whites (70.56 per 100,000 versus 65.00 per 100,000). White males accounted for 61% (6,592/10,881) of all hospital admissions by white residents (Figure 8). However, black males had a higher age-adjusted rate (105.75 per 100,000) compared to white males (82.16 per 100,000). White females though had a higher adjusted rate of hospital admission compared to black females (47.73 per 100,000 and 39.17 per 100,000).[5]

During 2003-2005, the age group with the highest age-specific rate of hospital admissions due to TBIs was the 85+ year olds (396 per 100,000). The lowest age-specific rate of hospital admissions due to TBIs was the 1-4 year old population. The age-specific rates began increasing with the 65+ year olds. However, the 0-1 year olds and 15-19 year olds had rates over 100 (131 per 100,000 and 100 per 100,000). Figure 9 shows the actual number of hospital admissions for each age group while Figure 10 shows the age-adjusted rate for each age group.[5]

The median total charge for patients admitted to the hospital for TBI was $30,803 (Range $63.00-$780,345) as compared to the mean total charge for all ages of $15,037 (Range $63.00-$780,345) (4). For 2003-2005, the total charges due to TBI patients who were admitted to the hospital were $422 million. The majority of the patients had Medicare/Medicaid (36%, 4,979/13,762) or commercial insurance (30%, 4,014/13,762) (Figure 11). The average length of stay for a TBI patient was 6.79 days (Range 1- 152 days) and the median length of stay was four days.[5]



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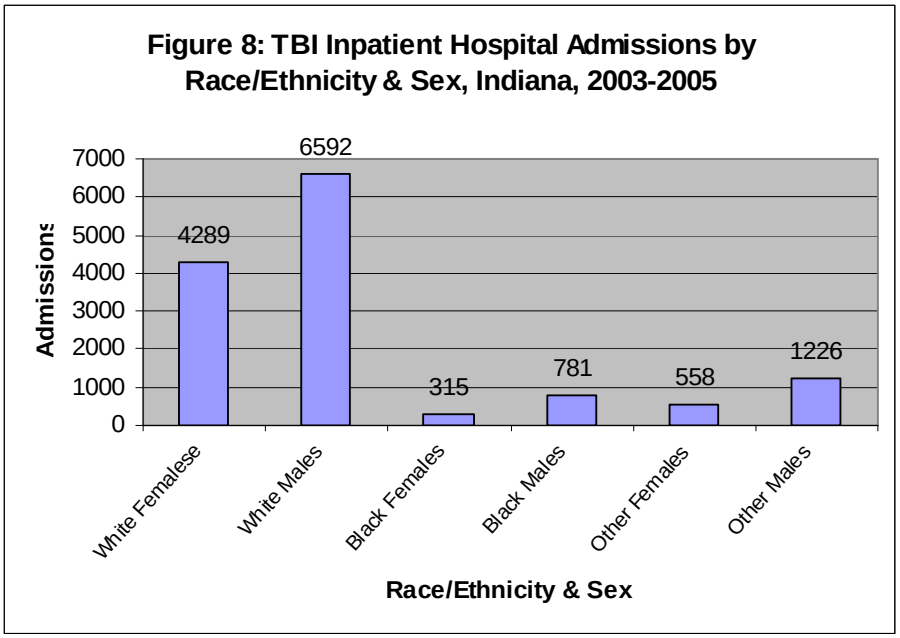

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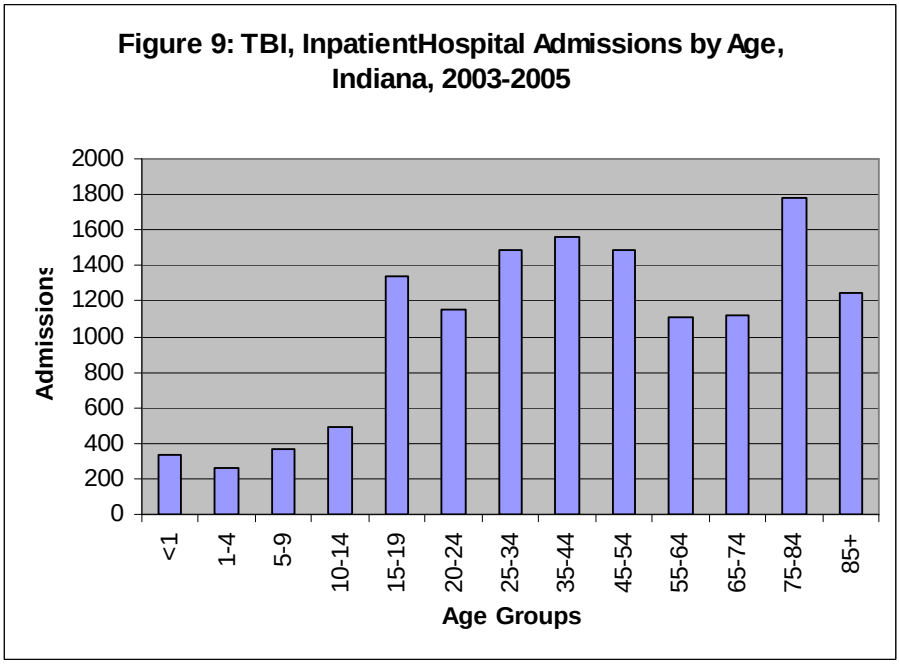

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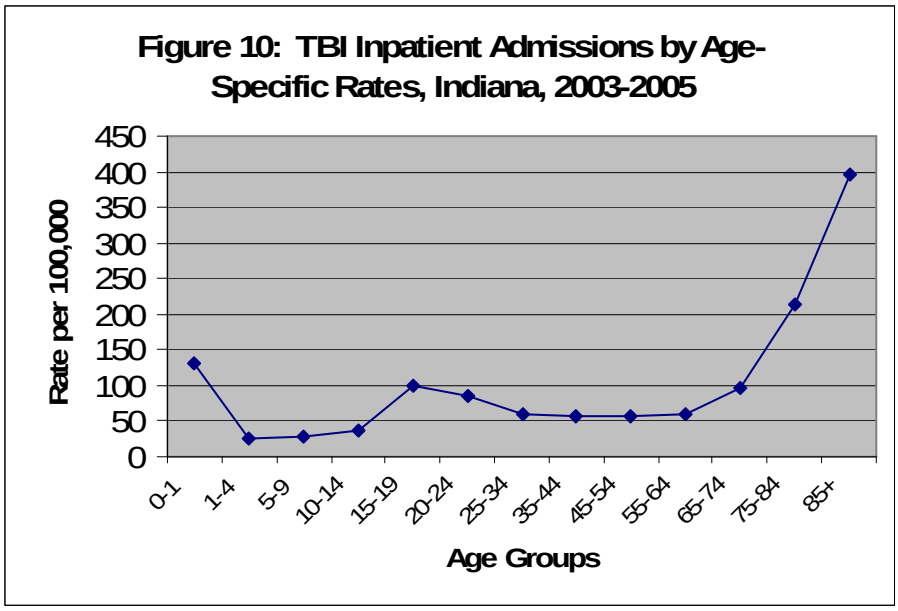

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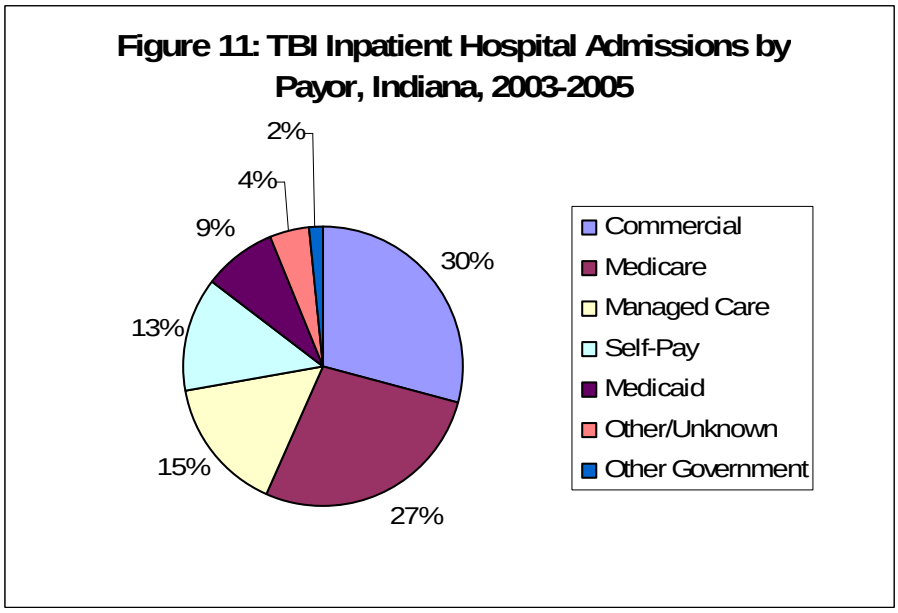

Source: Indiana State Department of Health, Hospital Discharge Data, 2003-2005

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